

**What is Claimed is:**

1. A method of fabricating nitride semiconductors in a Metal-Organic Chemical Vapor Deposition (MOCVD) reactor, the  
5 method comprising the following steps of:

(a) depositing GaN on an inner wall of the MOCVD reactor;

(b) loading a sapphire substrate into the MOCVD reactor;

(c) heating the sapphire substrate and injecting etching gas into the MOCVD reactor; and

10 (d) injecting  $\text{NH}_3$  gas into the MOCVD reactor to nitrify the surface of the sapphire substrate.

2. The method of fabricating nitride semiconductors according to claim 1, wherein the step (c) irregularly etches the  
15 surface of the sapphire and re-deposits the GaN onto the surface of the sapphire from the inner wall of the MOCVD reactor.

3. The method of fabricating nitride semiconductors according to claim 2, wherein the GaN re-deposited onto the  
20 sapphire is amorphous or polycrystalline.

4. The method of fabricating nitride semiconductors according to claim 1, further comprising the step of growing a nitride semiconductor layer on the nitrified surface of the  
25 sapphire substrate after the step (d).

5. The method of fabricating nitride semiconductors according to claim 1, wherein the sapphire substrate is replaced by one selected from a group including a silicon carbide (SiC) substrate, an oxide substrate and carbide substrate.

6. The method of fabricating nitride semiconductors according to claim 1, wherein the  $\text{NH}_3$  gas is replaced by one selected from a group consisting of tertiary-butylamine ( $\text{N}(\text{C}_4\text{H}_9)_2$ ), phenylhydrazine ( $\text{C}_6\text{H}_8\text{N}_2$ ) and dimethylhydrazine ( $\text{C}_2\text{H}_8\text{N}_2$ ).

7. A method of fabricating nitride semiconductors in a Metal-Organic Chemical Vapor Deposition (MOCVD) reactor, the method comprising the following steps of:

- (a) loading a sapphire substrate into the MOCVD reactor;
- (b) heating the sapphire substrate and injecting Tri-Methyl Gallium (TMG) or Tri-Ethyl Gallium (TEG) on a mixed gas containing  $\text{NH}_3$  gas and etching gas into the MOCVD reactor; and
- (c) injecting the  $\text{NH}_3$  gas into the MOCVD reactor to nitrify the surface of the sapphire substrate.

8. The method of fabricating nitride semiconductors according to claim 7, wherein the step (b) irregularly etches the surface of the sapphire substrate and deposits GaN on the surface

of the sapphire substrate.

9. The method of fabricating nitride semiconductors according to claim 7, further comprising the step of growing a  
5 nitride semiconductor layer on the surface of the nitrified surface of the sapphire substrate after the step (c).

10. The method of fabricating nitride semiconductors according to claim 7, wherein the  $\text{NH}_3$  gas is replaced by one  
10 selected from a group consisting of tertiary-butylamine ( $\text{N}(\text{C}_4\text{H}_9)_3$ ), phenylhydrazine ( $\text{C}_6\text{H}_5\text{NHNH}_2$ ) and dimethylhydrazine ( $\text{C}_2\text{H}_8\text{N}_2$ ).

11. The method of fabricating nitride semiconductors  
15 according to claim 7, wherein the sapphire substrate is replaced by one selected from a group consisting of a silicon carbide ( $\text{SiC}$ ) substrate, an oxide substrate and carbide substrate.

12. A nitride semiconductor structure produced via  
20 Metal-Organic Chemical Vapor Deposition (MOCVD), comprising:  
a sapphire substrate with an upper surface etched by etching gas, deposited with GaN and nitrified; and  
a GaN semiconductor structure formed on the semiconductor substrate.

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13. The nitride semiconductor structure according to claim 12, wherein the sapphire substrate is replaced by one selected from a group consisting of a silicon carbide (SiC) substrate, an oxide substrate and carbide substrate.